Belton Bridge
Spanning the Middle Fork of the Flathead
River, on Going-to-the-Sun Road
Glacier National Park
Flathead County
Montana

HAER No. MT-68

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
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HISTORIC AMERICAN ENGINEERING RECORD

BELTON BRIDGE
HAER MT-68

Location:	Spanning the Middle Fork of the Flathead River, on Going-to-the-Sun Road, approximately one-half mile upstream from the park entrance at West Glacier, Glacier National Park, Flathead County, Montana UTM: West Glacier Quad. 12/280700/5375900
Date of Construction:	1920
Structural Type:	Reinforced concrete arch bridge
Contractor:	Charles A. McGlung, Spokane, Washington
Engineer:	George E. Goodwin
Owner:	Glacier National Park
Use:	Closed to vehicular traffic since 1964
Significance:	The Belton Bridge was the western entrance to Glacier National Park from 1920 to 1938, and was one of the park's first major construction projects. Between 1933 and 1938, the bridge was also a vital link on Going-to-the-Sun Road, a 51-mile stretch of scenic road across the park. The road is significant as a unique engineering accomplishment of the early twentieth century, and as the first product of a 1925 cooperative agreement between the National Park Service and the Bureau of Public Roads. The Belton Bridge is one of approximately seventeen prominent masonry and concrete structures along Going-to-the-Sun Road.
Project Information:	Documentation of the Belton Bridge is part of the Going-to-the-Sun Road Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and Glacier National Park. Researched and written by Kathryn Steen, HAER Historian, 1990. Edited and transmitted by Lola Bennett, HAER Historian, 1992.

Going-to-the-Sun Road

The Belton Bridge is a reinforced concrete arch bridge that functioned as the western entrance to Glacier National Park from 1920 to 1938. The bridge spans the Middle Fork of the Flathead River, the southwestern boundary of the park, at Belton, Montana. The bridge was one of the most significant early construction projects of the park. For the bridge's last five years of service, it was an important link in the extraordinarily scenic Going-to-the-Sun Road that crosses Glacier National Park. The 51-mile road, built in sections between 1911 and 1933, and rebuilt during the next two decades, runs across the central portion of the park from east to west. Starting in the west, the road runs from West Glacier, along the 10-mile eastern shore of Lake McDonald and then up McDonald Creek for an additional ten miles. About one mile beyond the junction with Logan Greek, the road begins its ascent to Logan Pass. The road climbs at a 6-percent grade, passes through a tunnel, and turns at a major switchback called "The Loop." Following the contours of the sides of Haystack Butte and Pollock Mountain, the road passes over several bridges, culverts, and retaining walls, before reaching Logan Pass. Beyond the Pass, the road descends to the east along the sides of Piegan Mountain and Going-to-the-Sun Mountain before running along the north shore of St. Mary Lake. The road exits the park as it crosses Divide Greek near St. Mary, Montana.

Construction

In 1910, when Congress added Glacier National Park to the growing list of parks, there were very few roads within the new park's boundaries. The first superintendent of Glacier, William Logan, was one of several people in the park hierarchy who believed the park needed to become more developed and accessible. As a result, Logan placed a heavy emphasis on the construction of roads and trails. He directed the construction of a 2½-mile stretch of road from Belton (the Great Northern Railroad's station) to the foot of Lake McDonald. During the 1910s, road construction continued up the east shore of Lake McDonald.[1]

As the roads improved and park attendance increased, the need for a solid bridge over the Flathead River became harder to ignore. An old log bridge, about seventy feet east (upstream) of the Middle Fork Bridge of 1920, had carried the traffic since 1910. Possibly built as early as 1897,[2] the log bridge displayed a curiously arranged trusswork--there were no vertical or diagonal supporting members at the hip joints except the inclined end post.[3] In Logan's first superintendent's annual report (1911), he was already recommending to his superiors in the Department of the Interior that Belton needed a new bridge. In 1915, the park replaced several stringers, the deck planks, and added a new guardrail. Two years later, Acting Superintendent Goodwin reported the bridge was no longer safe.[4] Flathead County condemned the structure in 1918, but after some repairs, the county commissioners agreed to reopen the bridge.[5]

In 1919, after yet another repair to the bridge, the park administrators included money in their appropriations estimate to construct a new bridge.

Superintendent W.W. Payne worked with a Mr. Scott, a retired U.S. Reclamation engineer employed by Flathead County, to design the proposed bridge. The correspondence between Payne and George E. Goodwin, the chief engineer of the National Park Service, indicates the proposed bridge was an open spandrel reinforced concrete arch bridge.[6] The design called for an iron hand rail and three supporting reinforced concrete braces running the length of the bridge over the arch. Payne felt the open spandrel and iron rail would give a sense of "lightness" to the bridge. In attempting to convince his superiors to accept his design, Payne sent a picture of a "much advertised view of a bridge in Yellowstone." Payne suggested that his design would suit the proposed Glacier site as much as the Chittenden bridge conformed to Yellowstone.[7]

The bid for the bridge based on Payne's and Scott's design was never let. The $12,000 appropriation granted in 1919 to construct the bridge was spent fighting fires during the summer.[8]

In the fall of 1919, Chief Engineer George Goodwin wrote up the specifications for a bridge contract and publicized the letting in mid-November with the intention to open bids in January,1920. Goodwin's specifications allowed potential contractors to bid on either a reinforced concrete arch bridge or a steel truss bridge. Most people in the park service seemed to prefer the concrete option for aesthetic reasons, but were concerned that bids for a concrete bridge would exceed the available allotment of $10,800. They expected the steel truss to be a lower bid. In the specifications, Goodwin set up design and engineering parameters, but left the actual designing to the individual bidders.[9]

Goodwin sent notice of the bid letting to over thirty bridge manufacturers, including some of the most well-known names in the business. In addition, the park service notified newspapers in several cities, including Kalispell and Great Falls in Montana, and Spokane, Washington.[10] Although many bridge firms showed an interest in the project, only four companies actually submitted bids. When the bids were opened January 20, 1920, Security Bridge Company of Billings, Montana offered $10,794; Allied Contractors, Inc. of Omaha, Nebraska bid $8972; and Charles A. McClung of Spokane, Washington submitted estimates ranging from $10,200 to $14,000 for two different types of bridges and offered a lower price if the park provided necessary gravel, sand, and lumber (which Goodwin estimated would cost the park $1500 to $2000). In addition, contractor H.M. Kleifeld of Spokane arranged to submit a late bid.[11]

Engineer Goodwin inspected the plans for structural soundness and examined the bids. All of the bids were conditional--no contractor adhered exactly to the specifications or time requirements. The Security Bridge Company's plans failed to meet load requirements and the Allied Contractors bid diverged too much from the specifications to warrant serious attention. Of the remaining bids, Goodwin chose the Kleifeld bid. He thought he was selecting the low bid of $10,700, but in fact, he had misread the numbers. In the three weeks before Goodwin corrected himself, he passed the Kleifeld design to Charles A. Punchard, the landscape engineer for the National Park Service. Stephen Mather, the influential first director of the National Park Service, liked to have the input from a more aesthetically minded official as

well as from a structural engineer. Punchard was pleased with the design and made only a few minor suggestions about the moldings.[12]

Goodwin went as far as checking Kleifeld's financial health before realizing the bid was actually $12,700 instead of $10,700. The extra $2000 meant Charles A. McClung became the low bidder. McClung submitted bids for an open spandrel bridge and a less expensive closed spandrel. At $10,200, McClung would construct a closed spandrel, reinforced concrete, earth filled arch bridge, if the park provided 15,000 board feet of lumber and the required amounts of sand and gravel. Landscape Engineer Punchard agreed to the plan--McClung's design was similar to Kleifeld's, and Goodwin suspected the two designs came from the same designing engineer. After checking McClung's professional and financial references, his bid was accepted. The contract was signed April 29, 1920.[13]

Charles A. McClung was a civil engineer from Spokane who operated his own bridge construction firm. Several of his previous contracts were in the vicinity of Spokane. He built the Mullan Bridge for the County of Spokane and the West Riverside Bridge for the City of Spokane. He also constructed the bridges and culverts for a 22-mile stretch of state highway.[14]

McClung moved his equipment to the site from Spokane about June 10, 1920. The later date was primarily because of high water in the Flathead River during the spring. McClung spent most of June gathering his supplies and equipment and setting up camp. Among the equipment McClung originally intended to bring were wheel barrows, "buggies" (probably construction carts), a pump, and a 7S Rex concrete mixer that could produce 50 cubic yards in eight hours.[15]

In order to fulfill their part of the contract, the Glacier Park administrators were charged with supplying 200 cubic yards of sand and 360 cubic yards of gravel. George Goodwin, the National Park Service engineer, generally had the final word on the source of the aggregates as well as the construction. He recommended buying the gravel from Harvey Apgar, a concessioner at the foot of Lake McDonald whose land contained a small gravel pit. From there, the park employees could use a tractor to haul the gravel two miles back to the bridge site. Goodwin was less confident about finding a source of sand within the park. He had three suggestions. The park administrators could tap into the sand along Lake McDonald or local rivers; or they could reactivate a sand pit along the Belton to Lake McDonald road that had been used in road construction; or they could collect the sand in the process of screening the gravel. Goodwin even sent a sketch of a screening apparatus to accomplish the collection. If all else failed, the park could buy the sand from an outside pit--perhaps one belonging to the Great Northern--but that would be more expensive.[16]

The park was also responsible for supplying lumber. This posed less of a challenge since the park operated its own sawmill. McClung requested his 15,000 board feet be provided in 8x8s, 6x6s, 2x12s, 2x6s, and 2x4s.[17]

Near the middle of June, Goodwin arranged a meeting for McClung, Superintendent Payne, and himself to coordinate the supply sources, construction, and inspection of the Belton Bridge. Upon Goodwin's arrival, he became the acting superintendent because Payne was suspended from his post. Goodwin remained as acting superintendent through the remainder of the bridge

contract and allowed him ample supervision of the construction.[18]

A budgetary crunch was the first crisis Goodwin faced in his new position. The park was at the end of the fiscal year and had no money to purchase the sand and gravel necessary for the bridge. In an unorthodox administrative move, the Washington office directed Goodwin to purchase the necessary materials as the contract obligated, and then charge it to the fiscal appropriation of the following year. Another crisis followed near the end of July: the old log bridge once again suffered critical damage. McClung's contract required him to keep the old bridge operable while constructing the new, although the park would pay for the labor and materials that the repair project entailed.[19]

McClung was having as much difficulty as the park. The water on the Flathead River had stayed high fairly late into the summer and slowed McClung's progress. In addition,the post-war inflation and shortages affected the contractor's ability to secure sufficient labor and supplies. McClung was aware of the difficulty in obtaining steel and placed his order for reinforcing bars as early as April. He was less prepared for the national shortage of Portland cement and had considerable trouble staying on schedule. All of these problems, coupled with the park's tribulations, prevented McClung from completing his project on the specified date of September 15. He requested and received an extension until October 20.[20]

Between September 8 and 12, McClung poured the arch of the bridge. At the end of September, the concrete was up to the level of the deck. On the 25th, Goodwin stopped McClung's worked temporarily and reprimanded him for leaving out "weep hole openings" in the walls for drainage. Goodwin demanded the holes be drilled and weep hole pipes be inserted. In addition, Goodwin warned, McClung should double-check his screens to make sure rocks larger than the specified size were prevented from getting into the cement.[21]

In mid-November, McClung still had not finished. He received another extension of the deadline from October 20 to December 1. Once again, McClung cited the inability to procure materials as the justification for his request. Also, the weather had not cooperated with McClung so late into the fall. Goodwin passed on the request to Washington with his endorsement, but he chided McClung for laying off workers at the same time he was asking for more time to complete the project.[22]

McClung finished the bridge November 30, but would not be spared some further trials. Goodwin held up McClung's final payment until the park received compensation for some chains, a sack of oats, and labor expense for which he claimed McClung was responsible. In denying Goodwin's charges, McClung wrote Goodwin a sharply-worded letter that suggested the relationship between the two men had deteriorated over the course of the contract.[23]

Despite the hurdles associated with the construction of the Belton Bridge, the structure was well-received. In the superintendent's annual report of 1921, the new superintendent, J.R. Eakin, could report that the bridge "is a very substantial and beautiful concrete arch. ... It elects much praise and sets a standard for bridges that should be followed when possible." The bridge served as the entrance to Glacier Park until 1938. In 1936, the Great Northern built the underpass that still exists in West Glacier, and two years later the Montana State Highway Commission erected a new bridge over the

Middle Fork of the Flathead. The 1936 and 1938 structures formed the basis for a new entrance into the park. The Belton Bridge was subsequently allowed to deteriorate.[24]

In 1964, an extraordinary flood destroyed all of the bridge except the reinforced concrete arch. Down the river, the bridge of 1938 was completely destroyed. As a temporary measure, the park hired E.F. Matelich Construction Company of Kalispell, Montana, to build a timber superstructure on the bare arch to carry traffic for the tourist season of 1964.[25]

Materials

Specifications required McClung to use rock from ¼" to 1½" in diameter in the arch and hand rail. In the abutments and wing walls, the rock could be as large as 2½". McClung chose to use Trident cement manufactured by the Three Forks Company of Butte, Montana. His first order for reinforcing steel went to a company in Seattle that provided him with rough bars. However, the company failed to supply enough and McClung expected he would have to supplement the round bars with some square bars from a local Spokane firm. Little mention is made in the records after May about the source of sand, so it seems likely that one of Goodwin's original three suggestions was satisfactory.

Description

The Belton Bridge is a reinforced concrete arch bridge, about 160' long, that crosses the Middle Fork of the Flathead River at a point where the river banks' rock ledges provide a natural support for the bridge. Since 1920, the bridge has deteriorated substantially. The flood of 1964 caused the side walls of the bridge collapse and the earth fill to wash away, leaving a peculiar-looking bare arch. The extensive falsework required to build the bridge (15,000 board feet) left seams in the cement which are particularly visible on the extrados. The log cribbing, which dates to 1964, and cement walls that form the abutments and wing walls, are only precariously still intact. Above the concrete arch, a superstructure of timber supports a deck. The superstructure consists of nine vertical 8"x8" beams, which support the fifteen stringers that run lengthwise under the floor planks.

ENDNOTES

1. Gurtis W. Buchholtz, "The Historical Dichotomy of Use and Preservation in Glacier National Park," Master's Thesis, University of Montana, 1969.

2. Donald H. Robinson and Maynard G. Bowers, "Through the Years in Glacier National Park" (West Glacier, Montana: Glacier Natural History Association, 1960), 59.

3. Belton Bridge, Photograph (Glacier National Park Historic Photograph Collection).

4. Annual Report of the Superintendent of Glacier National Park, 1911, 1915, 1917. Unless otherwise noted, all correspondence, reports, and other park records are part of the Glacier National Park Library Historical Files, Glacier National Park, West Glacier, Montana.

5. Superintendent W. W. Payne to the Director of the National Park Service, June 18,1918.

6. Superintendent W.W. Payne to the Director of the NPS, April 11, 1919.

7. George Goodwin to Superintendent W.W. Payne, May 27, 1919; Superintendent W.W. Payne to George Goodwin, June 23, 1919; Superintendent W.W. Payne to the Director of the NPS, April 11, 1919; and Mark Hufstetler, "Glacier Historic Structures: Narrative Histories," 1988, pp. 112-115 (Glacier National Park Library).

8. Annual Report of Superintendent, 1919.

9. Goodwin to the Director of the NPS, October 20, 1919; Goodwin to the Director of the NPS, November 8, 1919.

10. A.B.Gammerer, Acting Director of NPS to Superintendent Payne, November 22, 1919; memos to newspapers, December 2, 1919.

11. "Abstract of Bids Received," January 20, 1920; Superintendent Payne to Goodwin, January 23, 1920.

12. Goodwin to Gharles A. Punchard, February 24, 1920; Stephen Mather to Goodwin, January 29, 1920; Superintendent Payne to Goodwin, February 27, 1920.

13. Goodwin to the Director of the NPS, March 2, 1920; Goodwin to the Director of the NPS, March 8, 1920; of the Glacier National Park Historical Files. McGlungs contract, dated April 29, 1920 belongs to Record Group 79 in the National Archives, Washington, D.G.

14. Gharles A. McGlung to Goodwin, March 4, 1920.

15. McClung to Goodwin, May 2, 1920; Superintendent's Monthly Report, June 1920; McClung to Goodwin, March 4, 1920.

16. Goodwin to Payne, May 17, 1920; Goodwin to Payne, June 4, 1920.

17. Payne, memo April 12, 1920.

18. Monthly Superintendent Report, June 1920.

19. Goodwin to the Director of the NPS, June 23, 1920; Acting Director Arno B. Cammerer to Goodwin, June 28, 1920; Goodwin to McClung, July 31, 1920.

20. Goodwin to the Director of the NPS, September 4, 1920; McClung to Goodwin, August 31, 1920; Bruce Seely, Building the American Highway System: Engineers as Policy Makers (Philadelphia, PA: Temple University Press, 1988), 57-58.

21. Goodwin to McClung, September 25, 1920.

22. McClung to Goodwin, November 20, 1920; Goodwin to the Director of the NPS, November 20, 1920; Goodwin to McClung, November 20, 1920.

23. Goodwin to McClung, December 3, 1920; McClung to Goodwin, December 7, 1920.

24. Annual Report of the Superintendent, 1921, 1936, 1938.

25. "Rampaging Rivers Destroy Homes, Highways, Rails," Hungry Horse (Montana) News, June 12, 1964, p. 1; Hungry Horse News, June 19, 1964, p. 1.

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Belton Bridge. Photograph (Glacier National Park Historic Photograph Collection, Glacier National Park, Montana.)

Buchholtz, Curtis. W. "The Historical Dichotomy of Use and Preservation in Glacier National Park." Master's Thesis, University of Montana, 1969.

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McClung's contract, 1920. (Record Group 79, National Archives, Washington, D.C.)

Rampaging Rivers Destroy Houses, Highways, Rails," Hungry Horse News, June 12, 1964, p. 1.

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